

Insight on the Issues**Star Power: The Effect of Angelina Jolie's Personal Story of BRCA1 Mutation on Testing Rates among Commercially Insured Women**

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Following Angelina Jolie's May 2013 *New York Times* op-ed about her double mastectomy after testing positive for a BRCA1 gene mutation, BRCA testing rates among women ages 35 and older enrolled in a large U.S. health insurance carrier increased. The increase was higher among women who had no personal history of breast, ovarian, or pancreatic cancer—women with the same profile as Angelina Jolie—than women with a cancer diagnosis. It was also higher for white and Hispanic women, compared with blacks and Asians. Although we cannot verify that Jolie's story was the only cause of the increase, our results strongly suggest that it was likely the main contributor to increased BRCA testing rates.

On May 14, 2013, Angelina Jolie published an opinion piece in the *New York Times* describing her decision to undergo a prophylactic (preventive) double mastectomy after testing positive for a mutation in the BRCA1 gene. Jolie did not have a diagnosis of breast cancer at that time, but revealed that her mother had died of ovarian cancer at age 56. In her article, she wrote:¹

I have a "faulty" gene, BRCA1, which sharply increases my risk of developing breast cancer and ovarian cancer. My doctors estimated that I had an 87 percent risk of breast cancer and a 50 percent risk of ovarian cancer.

She also wrote:

I wanted to write this to tell other women that the decision to have a mastectomy was not easy. But it is one I am very happy that I made. My chances of developing breast

cancer have dropped from 87 percent to under 5 percent. I can tell my children that they don't need to fear they will lose me to breast cancer.

Given her iconic celebrity status, coverage of her personal story was immediate, widespread, and lasted several months. Since Jolie's announcement, research and media reports have described sizable increases in the number of people seeking information about mastectomies and BRCA testing. This has been referred to as the "Angelina Jolie" effect. However, it is not known whether increased information seeking and awareness of the BRCA mutations led to an increase in genetic testing for breast cancer mutations in the United States. The purpose of this paper is to determine if BRCA genetic testing rates increased among commercially insured women in the United States after Jolie's story. To do so, we compared the number and rates of service claims for BRCA1 and BRCA2 tests in



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2013 for women ages 35 and older from a large commercial health insurance carrier, before and after her announcement.

Reaction Following Angelina Jolie's Story

Jolie's announcement was unique in the extent of media coverage that followed. She first published her story in the *New York Times*, which had the second-largest circulation in the United States at that time, at almost 1.9 million.² Not surprisingly, her story lit up the social and entertainment media outlets. She was on the cover of *People* magazine for 2 consecutive weeks (May 15, the day after her announcement, and May 22) and on the cover of *Time* magazine after that (May 27).³ More notable was the coverage by elite newspapers in the United States, United Kingdom, and Canada.⁴ These papers featured her story prominently in the news section of their papers—rather than the entertainment section—and continued coverage of her story for a month.⁵

The surge in the number of people seeking information about BRCA testing and mastectomies following her story was remarkable. On the day of her announcement, there were nearly 30,000 Wikipedia searches for BRCA1, compared with just under 800 searches the day before.⁶ The National Cancer Institute's fact sheet on preventive mastectomy had over 69,000 page views that day, a nearly 800-fold increase compared with a week earlier (only 87 views). Similarly, its fact sheet on genetic testing had a 31-fold increase in page views.⁷ Anecdotal reports and surveys also suggest an increase in the number of inquiries and appointments for genetic testing at cancer centers or oncologists in the United States.⁸

Similar reactions were noted outside the United States. For example, researchers at Sunnybrook Odette Cancer Center in Toronto, Canada, observed a doubling of the number of women referred to the center for genetic testing in the 6-month period after the announcement, compared with the same period the prior year. Referrals went from 487 to over 900.⁹ In another study in the United Kingdom, researchers documented a large increase in referrals to breast cancer family history clinics that lasted several months. Between May through October,

referrals increased by 50 percent to as much as 250 percent compared with the prior year.¹⁰

Did BRCA Testing Rates in the United States Increase?

Jolie's story and the extensive media coverage that followed appears to have increased information seeking and inquiries about BRCA testing. What remains unanswered is whether, in the United States, more women were getting the BRCA genetic test after Jolie's story. The above-referenced Canadian and United Kingdom studies noted increases in the number of BRCA testing, along with increased referrals. The United States, however, has a vastly different health insurance coverage system from Canada and the United Kingdom, where coverage is government-sponsored and universal. In the United States, coverage is primarily through private insurance plans for people ages 64 and younger and through Medicare, a public insurance program, for people ages 65 and older. The cost of the BRCA test can range from \$300 to \$5,000.¹¹ Insurance coverage rules dictate whether these costs would be covered for women seeking the test, which would likely influence the number of women getting the BRCA test.

An increase in BRCA testing rates in the United States would require some combination, or all, of the following: (a) more women requesting the test from their physicians, (b) more physicians ordering the test for more women, and (c) insurance plans approving more tests. If insurance plans did not relax or expand their criteria for BRCA testing during the period of study, then an increase in BRCA testing rates could be due to Jolie's announcement. More importantly, it could also suggest that the women getting the test are those who meet the risk profile and are appropriately receiving the test, which would be a positive outcome.

We find evidence that BRCA testing increased immediately after Jolie's announcement among insured women from a large commercial health insurance carrier. The timing of the increase suggests that it was largely due to Jolie's announcement and not due to changes in insurance coverage policy. We detail our findings in the

sections below and discuss limitations in the data that prevent us from attributing the increase exclusively to her story.

Findings from Patterns in the Data

To address our question, we use data from the Optum Labs database, which includes claims from a large health insurance carrier.¹² The study sample includes over 6.5 million health insurance claims in 2013 for women ages 35 and older enrolled with this insurance carrier. Our results and discussion applies to this carrier’s enrolled population and not the U.S. insured population (see Appendix A for more detail).

Figure 1 below shows the proportion of insured women ages 35 and older who had a BRCA test for each month from January through December 2013 (more precisely, it shows monthly BRCA testing rates, per 10,000 women).

From January through April 2013, between 2 and 2.5 of every 10,000 insured women ages 35 and older received a BRCA test. However, in May 2013, the month of Jolie’s announcement, that rate increased to over 3 of every 10,000 women (about a 40 percent increase) and stayed at an elevated level for the rest of the year.

Possible Explanations for the Increase in BRCA Testing Rates

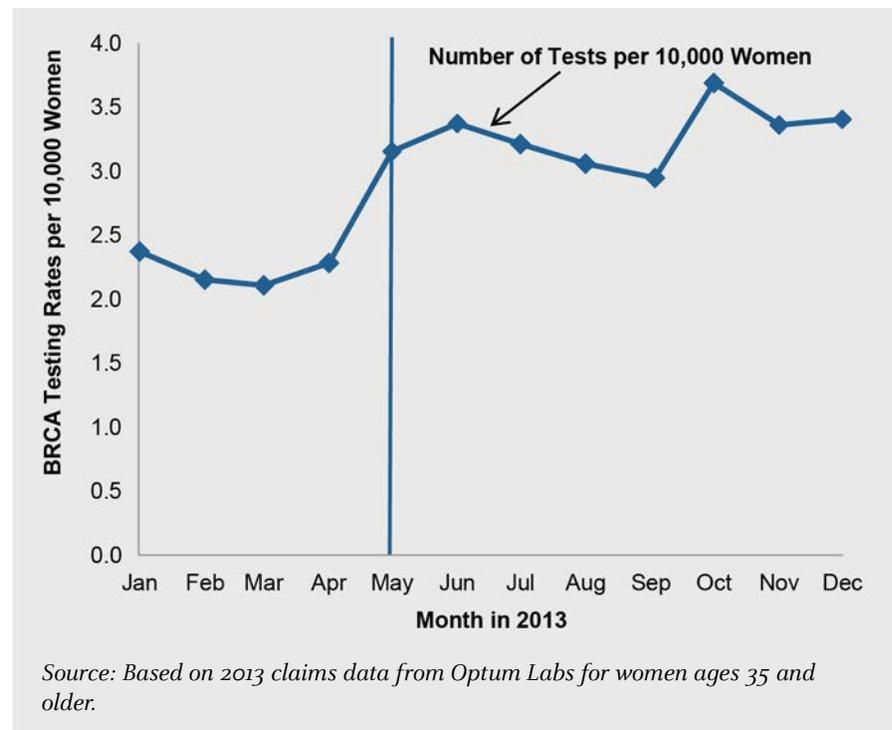
Jolie’s story was published on May 14, the second Tuesday that month. Potentially, her story could have increased rates in May

and beyond. However, two other events at that time, described below, could also have contributed to increased testing rates.¹³ It is important to note that neither of these two events had the same intensity or scope of media coverage as Jolie’s story.

First, the U.S. Prevention Services Task Force (USPSTF) issued draft recommendations for BRCA counseling and testing on April 3, 2013.¹⁴ The draft recommendation clarified that testing for high-risk women qualifies as a preventive service with a B rating.^{15,16} If adopted, under the Affordable Care Act, this clarification meant that insured women would no longer have to pay any cost sharing for obtaining that test. The USPSTF finalized its recommendations in December 2013. Previous work by the Agency for Healthcare Research and Quality suggests that health plans have moderate knowledge of newly released *final* USPSTF recommendations.¹⁷ The extent to which *draft* recommendations could have changed practice standards and testing rates is likely small, potentially not at all. Nonetheless, for completeness, we include the release of the draft recommendation as a potential explanation for the increase in May and beyond.

Second, around the same time, the U.S. Supreme Court heard the case of *Association for Molecular Pathology et al. v. Myriad Genetics, Inc., et al.* Myriad Genetics had patented the BRCA1 and BRCA2 genes and, at that point, had exercised a monopoly over BRCA testing for breast

**Figure 1
BRCA Testing Rates Increased in May 2013 and Stayed Elevated**



and ovarian cancer in the United States. The case was significant because it could affect future gene patents, scientific research, and, potentially, BRCA testing costs. The Supreme Court heard the case on April 14, 2013, and the court ruled on June 13, 2013. Conceivably, news and coverage of the case (which was concentrated among the scientific and genetic-testing community) could have resulted in increased testing rates in May or later.¹⁸

Earlier, we noted that BRCA testing rates could also increase if insurance coverage policy changed during this period. The insurance carrier whose data we used modified its coverage policy and waived cost sharing for BRCA testing for high-risk women to conform to the new USPSTF recommendations in October 2013. The changes occurred 5½ months after Jolie’s story, however. They are unlikely to have affected rates from May through September.

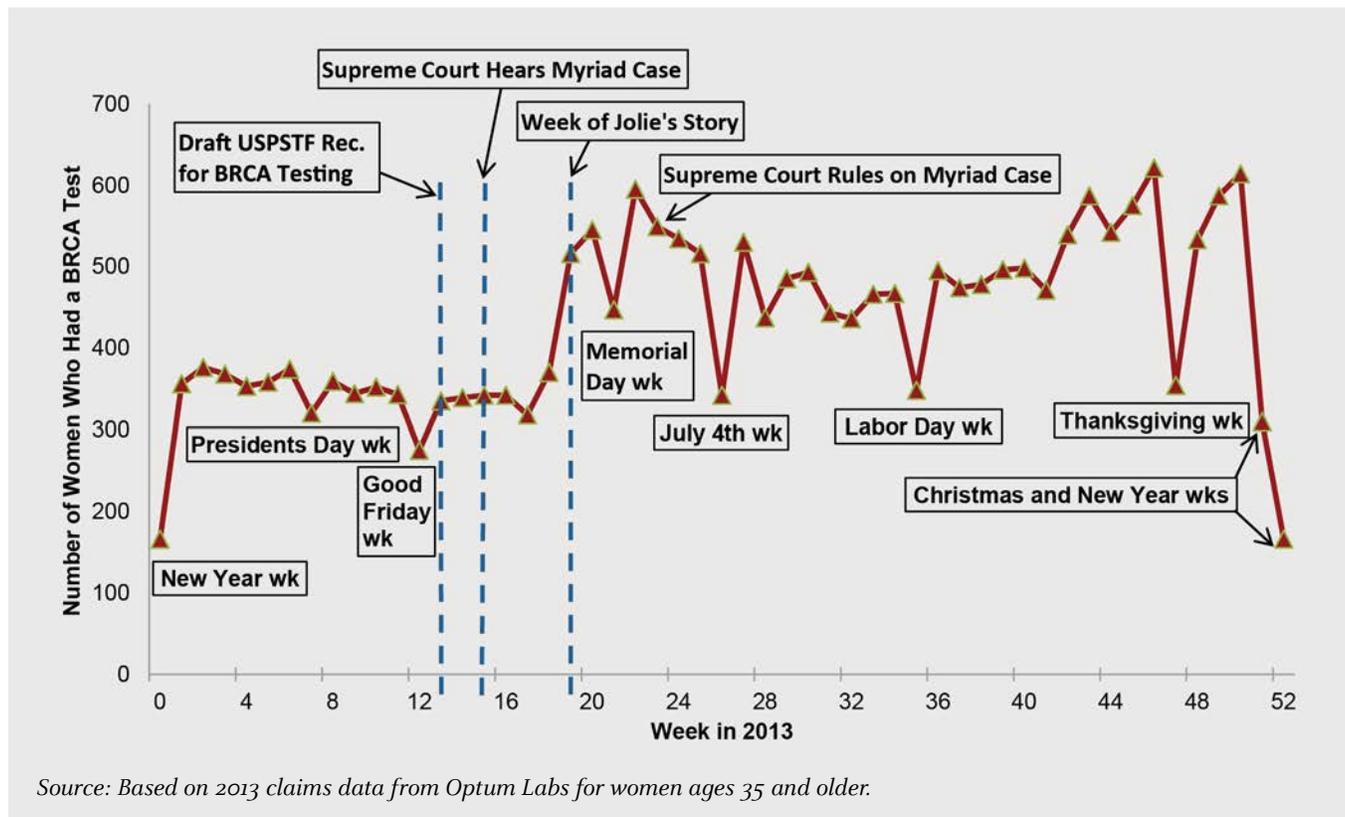
Which Explanation Had More Influence on Testing Rates?

To isolate more precisely the timing of the uptick in May and to parse out these competing explanations, we looked at the weekly counts of BRCA tests in 2013 (figure 2). We present counts instead of rates because of data limitations.¹⁹ The vertical lines in the figure indicate the week in which the news event occurred. A few patterns emerge from the data.

First, the number of BRCA tests each week fluctuates over the course of the year; however, there are some obvious dips in the weekly counts that coincide with major U.S. holidays, such as the New Year, Good Friday, Memorial Day, Independence Day, Labor Day, to name a few. We highlighted these dips and corresponding holidays in figure 2.

Second, prior to the week of Jolie’s story (weeks 1–19), the number of tests each week was relatively stable and hovered around 350 (excluding the dip that coincides with the week

Figure 2
Number of BRCA Tests Increased the Week of Angelina Jolie’s Story



of Good Friday). Beginning with the week of her story (week 20), the number of weekly BRCA tests jumped and hovered around 500 (again, excluding the dips that coincide with major holiday weeks). In fact, between weeks 19 and 20, BRCA testing increased from 370 to 516, a 40 percent increase.

Third, the data do not reveal any similar increase the week when the USPSTF issued its draft recommendations or the weeks of the Supreme Court hearing of and ruling on the Myriad case.

No doubt, any and all of these events might have contributed to the spike in testing in week 20. It may take time to schedule a doctor’s appointment or a blood draw, for instance, which could delay the effects of the USPSTF draft recommendation or the Supreme Court case. Nevertheless, the fact that the increase occurred the week of Jolie’s story, with the extensive publicity surrounding it, suggests that the impact of her story may have had more to do with the increase than these other less-covered and less-known news events.²⁰

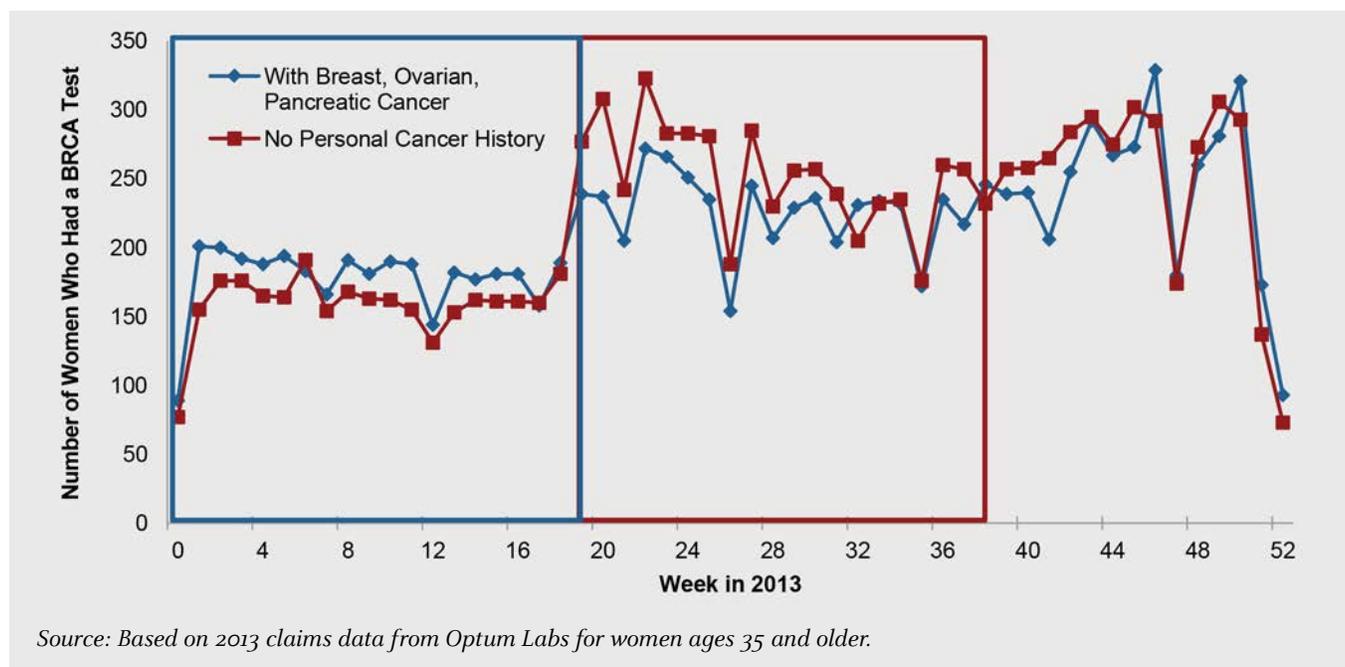
Who Is Getting the BRCA Test?

By Cancer Diagnosis

To further refine our analysis, we next examined characteristics of women who received the test. Physicians recommend BRCA testing as a means to identify treatment options for women with a cancer diagnosis. In addition, it is also recommended for certain women with no personal cancer history but whose family history increases their cancer risk.²¹ Figure 3 shows weekly BRCA testing counts for two groups of women. The blue line represents women who had a diagnosis of breast, ovarian, or pancreatic cancer, and the red line represents women with no personal history of cancer—women similar in profile to Jolie’s situation.²²

We focus our discussion on the two boxed areas in figure 3 (blue and red), which span weeks 1 through 39. Week 20 is the week of Jolie’s announcement. We limit the discussion to periods before week 40 (which is the first week of October). The insurance carrier waived cost sharing for BRCA testing starting October 1, 2013. This change may have increased testing rates from October and beyond

Figure 3
BRCA Testing Increased More among Women with No Cancer Diagnosis after Jolie’s Story



and could confound our analysis of the “Angelina Jolie” effect.²³

Comparing the number of tests in the blue-boxed area to those in the red-boxed area, three interesting points emerge. First, prior to Jolie’s story (blue box), women with a cancer diagnosis had more tests than women without. Second, during the week of her story (week 20), testing for both groups of women increased, but the increase among women without a personal cancer history—women who mirrored Angelina Jolie’s profile—was nearly twice that of women with a cancer diagnosis (53 percent versus 26 percent). Third, after Jolie’s story (red box), there were consistently more women without a personal cancer history getting tested for BRCA than women with cancer. This is a reversal of trend compared with the weeks before Jolie’s story.

By Age Group

Figure 4 compares testing rates of our sample women by age groups (35–49, 50–64, and 65-plus). It reports testing rates for the four months before and after May 2013.²⁴ Overall, younger women are more likely to get tested for BRCA mutations than older women. In addition, we see that, after Jolie’s story, testing rates increased for women in all age groups, but the increase was higher for women 64 years of age and younger than for women ages 65 and older.

By Race/Ethnicity

Next, we examined whether the reaction to Jolie’s story varied by

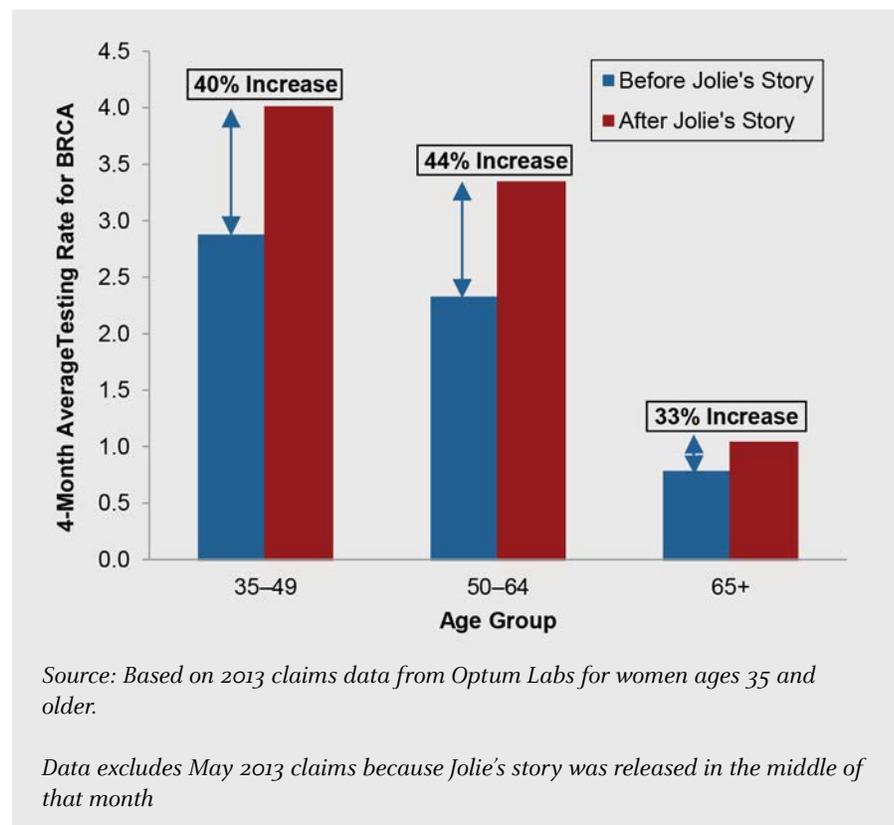
race/ethnicity (figure 5).²⁵ We observed an increase for all racial/ethnic groups; however, the largest increase was among white and Hispanic women. After Jolie’s story, BRCA testing rates increased by over 40 percent for these two groups; nearly twice and three times higher than among black and Asian women, respectively.²⁶

Summary of Results

Did Jolie’s story increase BRCA testing among commercially insured women in the United States? In our sample of women enrolled in a large insurance carrier, we observed an immediate increase in BRCA testing rates after Jolie’s announcement that lasted at least 4 months. Overall, rates increased by about 40 percent. Potentially, other events may also have influenced BRCA testing rates, but the patterns in the data are highly suggestive that her story was a major contributor.

In addition, we observed that women who mirrored Jolie’s profile—those who did not have a personal history of cancer—responded more to her story than women with a cancer diagnosis. In addition, white and Hispanic women were also more likely to respond to her

Figure 4
After Jolie’s Story, BRCA Testing Rates Increased More for Women 64 and Younger than for Women 65 and Older



story compared with blacks and Asians, as were women ages 64 and younger.

Discussion

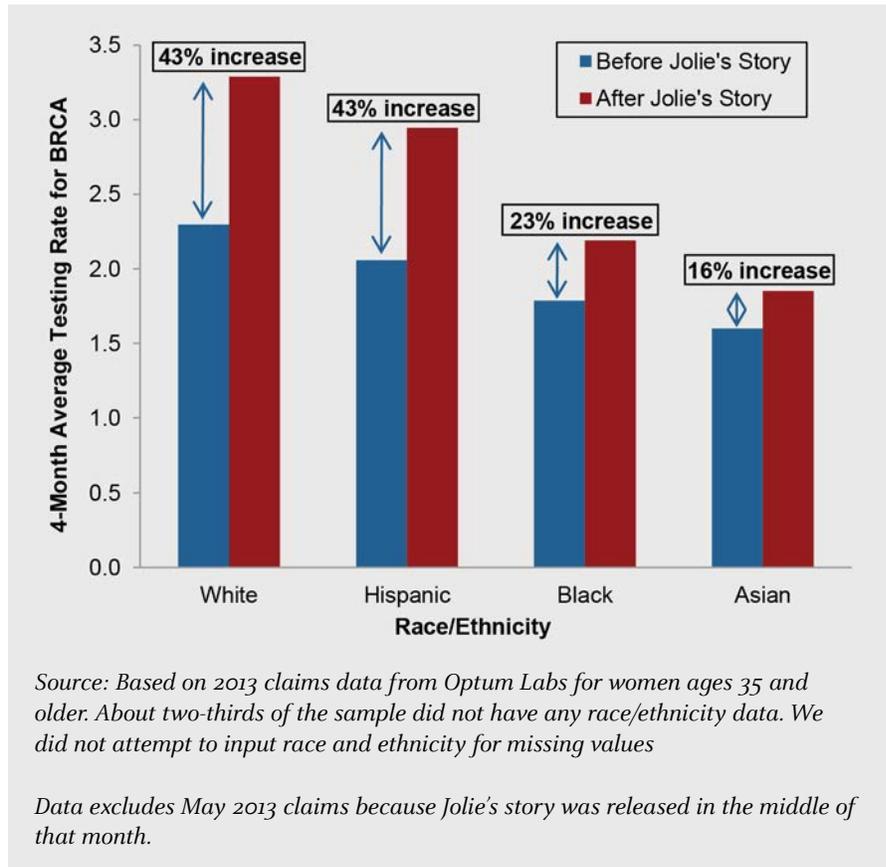
Prior to Jolie's story, most women were likely unfamiliar with the BRCA1 and BRCA2 genes. Because of her story, more women now know that a woman with a harmful mutated copy of one of these genes has a significantly higher risk of developing breast and ovarian cancer during her lifetime.

Raising awareness about the risk associated with these harmful mutations is certainly beneficial. It facilitates conversations between high-risk women and their doctors about testing and preventive measures and allows patients to make informed decisions about next steps. Taking preventive steps could save lives or, at the very least, significantly reduce a person's cancer risk. Either of these outcomes would be a public benefit. Based on patterns in our data, Jolie's story may have provided that benefit.

However, alongside the message of elevated risk was also the message that only a small proportion of women is at risk of having a harmful BRCA mutation. Of the 12 percent of women likely to develop breast cancer during their lifetimes, only 5–10 percent is attributable to harmful BRCA mutations.²⁷ Based on these numbers, less than 1.2 percent of all women will have a harmful BRCA mutation that significantly elevates their risk for breast cancer. Prevalence rates vary by

Figure 5

After Jolie's Story, BRCA Testing Increased More for Whites and Hispanics than for Blacks and Asians



ethnicity and can be as low as under 1 percent for Asians and as high as 10 percent among Ashkenazi Jewish women.²⁸ The odds are even lower for ovarian cancer.

Jolie's story may not have elevated understanding of the overall risk of cancer with the faulty BRCA mutation. A survey fielded a month after her story noted that less than 10 percent of respondents accurately estimated Jolie's risk of developing breast cancer, relative to someone without the BRCA mutation.²⁹ In addition, content analysis of elite newspaper coverage of her story indicated that only a third of the stories mentioned the rarity of the harmful BRCA mutation in the general population.³⁰

BRCA testing is neither appropriate nor recommended for all women. Jolie's superstardom drove many women to inquire about the test, which is fine, but it would be both costly and detrimental if women were unnecessarily tested or chose prophylactic surgery as a result of misinformation about their risk factor. Among U.S. insurance carriers, coverage for BRCA testing typically requires meeting insurance

coverage requirements—thus, even if someone requests a test, insurance may not pay for it. Paying out-of-pocket for the full cost of the test may deter some unnecessary testing.

The media is rife with stories and opinions about the public benefit or harm of Jolie’s announcement.³¹ It is difficult to weigh the benefit of additional information against the costs and consequences of potentially unnecessary testing. However, there may be opportunities to leverage this “learning” window—to use instances of celebrity announcements to educate consumers.

We observed a substantial increase in information seeking from public sources (such as the National Cancer Institute) for BRCA testing after Jolie’s op-ed piece. However, the scale was much smaller for increased inquiries and appointments at genetic counseling centers, referrals to cancer centers (in Canada and the United Kingdom), and testing for our sample of insured women. Potentially, genetic counseling and consults with doctors and other clinicians are crucial interaction points to help consumers make better-informed decisions.

Appendix A

The Data

This study was conducted using the Optum Labs database.³² The retrospective administrative claims data used in this study included medical claims and eligibility information from a large national U.S. health insurance plan. Individuals covered by this health plan, about 28.2 million (51 percent female) in 2013, are geographically diverse across the United States, with greatest representation in the South and Midwest U.S. Census regions. The health insurance plan provides fully insured coverage for professional (e.g., physician), facility (e.g., hospital), and outpatient prescription medication services. All study data were accessed using techniques that are in compliance with the Health Insurance Portability and Accountability Act (HIPAA) of 1996, and no identifiable protected health information was extracted during the course of the study.

For this study, we analyzed the proportion of women enrolled with this health carrier ages 35

and older who had a service claim for BRCA1 and BRCA2 testing. The data include actual date of service for the claim, which would be the date the blood sample was drawn. We used Current Procedural Terminology (CPT) codes 81211–81217 to capture BRCA testing claims in 2013.

The data also include basic demographic information, such as age, race and ethnicity, type of insurance coverage, whether the individual had a cancer diagnosis, and the type of cancer. We used the codes 183.2–183.4, V16.41, and V50.42 for ovarian cancer; 174.1–174.6, 174.8, 174.9, 233.0, V16.3, V50.41, and V84.01 for breast cancer; and 157.1–157.9, V10.09, and V16.0 for pancreatic cancer.

We restricted our analysis to calendar year 2013 for the reason explained below.

Prior to 2013, BRCA tests could be billed under the Healthcare Common Procedure Coding System (HCPCS) codes S3818–S3823 or using molecular pathology services codes from the 83890–83914 code series. However, these molecular pathology services codes did not identify the specific genetic test. Consequently, many genetic test providers engaged in a common practice known as “code stacking,” which involved using a series of codes, 83890–83914, to describe the testing process. Code stacking, however, made it difficult for health plans to know what exactly was being tested and what they were reimbursing, since the stacking codes did not indicate the specific analysis being tested.³³ As such, the American Medical Association defined new CPT codes for molecular diagnostic testing that would specifically identify the tests performed. The new CPT codes were effective January 2012. These are codes 81211–81217 for BRCA testing.

Further, starting April 1, 2012, the HCPCS codes listed above were deleted and no longer in use. Although the new 2012 CPT codes were supposed to replace the 83890–83914 code series, issues regarding the reimbursement using the new codes led many providers and payers to continue reporting the 83890–83914 codes in 2012. Starting 2013, the 83890–83914 codes were deleted and no longer in use.³⁴

Thus, for our study, using the new 2012 CPT codes in 2013 would capture all BRCA claims submitted to the health plan in 2013. If we wanted to extend our

analysis to 2012, we would need to capture BRCA tests billed under the new and since-deleted codes. Even using a combination of HCPCS, the 83890–83914 code series, and new 2012 CPT codes, we would likely undercount the number of BRCA tests in 2012 since we do not know exactly how genetic test providers were stacking their codes to optimize billing.

Appendix B

USPSTF Final Recommendations for BRCA1/2 Screening and Testing, Issued December 2013³⁵

The task force recommends that primary care providers screen women who have family members with breast, ovarian, tubal, or peritoneal cancer with one of several screening tools designed to identify a family history that may be associated with an increased risk for potential harmful mutations in breast cancer susceptibility genes (BRCA1 and BRCA2). Women who screen positive should receive genetic counseling and, if indicated after counseling, BRCA testing. **Grade B**

Appendix C

Coverage Criteria for the Health Insurance Carrier from the Optum Labs Database³⁶

BRCA Testing Criteria

- I. *BRCA1* and *BRCA2* testing is proven and medically necessary for women **with** a personal history of breast cancer in the following situations:
 - A. Breast cancer diagnosed at age 45 or younger with or without family history; **or**
 - B. Breast cancer diagnosed at age 50 or younger with:
 1. At least one close blood relative with breast cancer at any age; **or**
 2. An unknown or limited family history
 - C. Breast cancer diagnosed at any age with:
 1. Two breast primary cancers, when first breast cancer diagnosis occurred prior to age 50; **or**
 2. Personal history of ovarian cancer; **or**
 3. At least one close blood relative with breast cancer diagnosed at age 50 or younger; **or**
 4. At least two close blood relatives on the same side of the family with breast cancer at any age; **or**
 5. At least one close blood relative with ovarian cancer at any age; **or**
 6. At least two close blood relatives on the same side of the family with pancreatic or prostate (Gleason score ≥ 7) cancer at any age; **or**
 7. Close male blood relative with breast cancer; **or**
 8. At least one close blood relative that has a *BRCA1* or *BRCA2* mutation; **or**
 9. Ashkenazi Jewish or ethnic groups associated with founder mutations; testing for Ashkenazi Jewish founder-specific mutations should be performed first
- D. Triple negative breast cancer diagnosed at age 60 or younger
- II. *BRCA1* and *BRCA2* testing is proven and medically necessary for women **with** a personal history of ovarian cancer.
- III. *BRCA1* and *BRCA2* testing is proven and medically necessary for women and men **with** a personal history of pancreatic cancer at any age and at least two close blood relatives on the same side of the family with breast, ovarian, pancreatic, and/or prostate (Gleason score ≥ 7) cancer at any age. If the person is of Ashkenazi Jewish ancestry, only one additional affected relative is needed.
- IV. *BRCA1* and *BRCA2* testing is proven and medically necessary for men **with** a personal history of prostate (Gleason score ≥ 7) cancer at any age and at least two close blood relatives on the same side of the family with breast, ovarian, pancreatic, and/or prostate (Gleason score ≥ 7) cancer at any age.

- V. *BRCA1* and *BRCA2* testing is proven and medically necessary for men **with** a personal history of breast cancer.
- VI. *BRCA1* and *BRCA2* screening tests are proven and medically necessary for men and women **without** a personal history of breast or ovarian cancer with at least one of the following familial risk factors:
- At least one first- or second-degree blood relative meeting any of the above criteria (I–V); **or**
 - At least one third-degree blood relative with breast cancer and/or ovarian cancer who has at least two close blood relatives with breast cancer (at least one with breast cancer at age 50 or younger) and/or ovarian cancer; **or**
 - A known *BRCA1/BRCA2* mutation in the family (defined as first-, second-, or third-degree relative)
- Note:** National Comprehensive Cancer Network (NCCN) guidelines state that significant limitations of interpreting test results for an unaffected individual should be discussed. Testing of unaffected individuals should be considered only when an appropriate affected family member is unavailable for testing. Clinical judgment should be used to determine if the patient has reasonable likelihood of a mutation (NCCN, 2014).
- VII. *BRCA1* and/or *BRCA2* testing is unproven and not medically necessary for all other indications including (1) screening of breast or ovarian cancers for individuals not listed in the proven indications above or (2) for risk assessment of other cancers.
- Further evidence is needed to establish the clinical utility of testing in other populations.

Additional Information

Note: If there are no living family members with breast or ovarian cancer, consider testing family members affected with cancers thought to be associated with *BRCA1/BRCA2*, prostate (*Gleason score* ≥ 7) and pancreatic cancers, and melanoma.

Acknowledgments

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- Jolie's op-ed is available at: http://www.nytimes.com/2013/05/14/opinion/my-medical-choice.html?_r=0.
- Circulation numbers for March 2013 from <http://www.poynter.org/news/mediawire/211994/new-york-times-passes-usa-today-in-daily-circulation/>.
- Dina, L.G., Borzekowski, Y.G., Smith, K.C., Erby, L.H., and Roter, D. L. "The Angelina Effect: Immediate Reach, Grasp, and Impact of Going Public," *Genetics in Medicine*, Vol. 16, No. 7, July 2014.
- Kamenova, K., Reshef, A., and Caulfield, T. "Angelina Jolie's Faulty Gene: Newspaper Coverage of a Celebrity's Preventive Bilateral Mastectomy in Canada, the United States, and the United Kingdom," *Genetics in Medicine*, Vol. 16, No. 7, July 2014. The authors defined "elite" newspapers as papers with broadsheet format, tendency to include more text and longer articles, focus on "hard news," intended for a more educated audience, and higher quality of journalism/high level of ethical practice. These newspapers included *The Times of London* (United Kingdom), the *Wall Street Journal* (United States), and the *Globe and Mail* (Canada), to name a few.
- Coverage was more extensive the first three days but was ongoing for the month that the study tracked coverage.
- Available at: <http://stats.grok.se/en/201305/BRCA1>.
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- Available at: http://www.breastcancer.org/symptoms/testing/genetic/facility_cost.
- See Appendix A for more information about the data and rationale for the period over which we examined BRCA testing rates.
- We conducted an extensive Internet search to identify any BRCA-related news events at or

- before the time of Jolie's story that potentially could have contributed to higher awareness of BRCA testing or plausibly motivated higher BRCA testing rates.
- 14 Created in 1984, the USPSTF is an independent group of national experts in prevention and medicine that makes evidence-based recommendations about clinical preventive services such as screenings, counseling services, or preventive medications.
 - 15 According to the USPSTF, a grade of "B" is defined as: "The USPSTF recommends the service. There is a high certainty that the net benefit is moderate of there is moderate certainty that the net benefit is moderate to substantial."
 - 16 The USPSTF previously issued recommendations regarding BRCA counseling in 2005, but the language was ambiguous with regard to BRCA testing. "High-risk women" is defined as women with no personal history of cancer but who have a family history of cancer. See Appendix B for more details of the USPSTF recommendations.
 - 17 Alycia Infante, et al., *Evaluation of the U.S. Prevention Services Task Force Recommendations for Clinical Preventive Services*, Agency for Healthcare Research and Quality, No. 08-M011-EF, December 2007.
 - 18 National Public Radio coverage of the Myriad case before the Supreme Court on April 15, 2013: <http://www.npr.org/blogs/health/2013/04/15/177035299/supreme-court-asks-can-human-genes-be-patented>.
 - 19 The data give actual dates of service. However, health insurance enrollment data are available only by month. Consequently, we do not have the granularity required to identify whether an individual was enrolled in a particular week during the month, which is necessary to construct weekly rates.
 - 20 Despite our extensive Internet search of news events around this time, there may have been other stories we did not identify that also contributed to increased testing rates.
 - 21 Per the USPSTF recommendations.
 - 22 We include women with pancreatic cancer, in addition to those with breast and ovarian cancer, because these women are indicated (appropriate) for BRCA testing according to the carrier's coverage policy. See Appendix C. The group of women with no personal history of cancer includes those with a family history and those without. Our data do not contain family history information to allow us to define a group with family history.
 - 23 Numerous studies show that consumers are price-sensitive and consume more health care services when prices are lower (or eliminated, as the case was in this instance). The most notable is the RAND health insurance experiment: Manning, W.G., Newhouse, J.P., Duan, N., Keeler, E.B., and Leibowitz, A. "Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment," *The American Economic Review*, Vol. 77, No. 3, June 1987, pp. 251–277. In fact, in our data, we observe an upward trend in BRCA testing rates starting in October in figure 1 and in week 40 in figure 2.
 - 24 We exclude May 2013 because it is an incomplete month, in that Jolie's announcement was in the middle of the month.
 - 25 About a third of the sampled women did not have any race and ethnicity information. We are unable to ascertain whether the missing data are randomly assigned—that is, whether the data are missing in equal proportion across all racial/ethnic groups or whether they tend to be missing more for one group. We did not attempt to impute race/ethnicity data where missing.
 - 26 This ordering aligns with risk factors by ethnic groups. John E.M., Miron A., Gong G., et al. "Prevalence of Pathogenic BRCA1 Mutation Carriers in Five U.S. Racial/Ethnic Groups," *JAMA*, Vol. 298, No. 24, 2007, pp. 2869–2876.
 - 27 Available at: <http://www.cancer.gov/cancertopics/factsheet/Risk/BRCA>.
 - 28 See the following site for prevalence rates of BRCA1/2 mutations among women with breast cancer, by ethnic groups, adapted from National Cancer Institute materials: <http://www5.komen.org/BreastCancer/InheritedGeneticMutations.html>.
 - 29 Dina et al., 2014.
 - 30 Kamenova et al., 2014.
 - 31 For instance, see the May 27 issue of the *Times* magazine article "The Angelina Effect" and Jeff Nisker, "A Public Health Education Initiative for Women with a Family History of Breast/Ovarian Cancer: Why Did It Take Angelina Jolie?" *Journal of Obstetrics and Gynaecology Canada*, Vol. 35, No. 8, 2013, pp. 689–691.
 - 32 Wallace P.J., Shah, D.T., et al. "Optum Labs: Building a Novel Node in the Learning Health Care System," *Health Affairs*, Vol. 33, No. 7, 2014, pp. 1187–1194.
 - 33 Available at: <http://www.hayesinc.com/hayes/blog/blog-are-you-ready-for-new-cpt-codes-for-molecular-tests/>.
 - 34 Available at: <http://www.psapath.com/NewsAndInformation/PSAAAlert2013CPTChanges/tabid/290/Default.aspx>.
 - 35 Available at: <http://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/brca-related-cancer-risk-assessment-genetic-counseling-and-genetic-testing>.
 - 36 Available at: https://www.unitedhealthcareonline.com/ccmcontent/Provider11/UHC/en-US/Assets/ProviderStaticFiles/ProviderStaticFilesPdf/ToolsandResources/PoliciesandProtocols/MedicalPolicies/MedicalPolicies/Genetic_Testing_HBOC_Syndrome.pdf.

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AARP's Public Policy Institute conducted this study using the Optum Labs database. The retrospective administrative claims data utilized in this study include medical claims and eligibility information from a large national U.S. health insurance plan. Individuals covered by this health plan, about 28.2 million (51 percent female) in 2013, are geographically diverse across the United States, with greatest representation in the South and Midwest U.S. Census regions. The health insurance plan provides fully insured coverage for professional (e.g., physician), facility (e.g., hospital), and outpatient prescription medication services. All study data were accessed using techniques that are in compliance with the Health Insurance Portability and Accountability Act (HIPAA) of 1996, and no identifiable protected health information was extracted during the course of the study.